

Contribution to the knowledge of European Bourletiellidae (Collembola, Symphypleona) . I .

On a standard of description and on the genus *Fasciosminthurus* Gisin, 1960 sensu Bretfeld, 1992.

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Contribution to the Knowledge of European Bourletiellidae (Collembola, Symphypleona) . I . On a standard of description and on the genus *Fasciosminthurus* Gisin, 1960 sensu Bretfeld, 1992. – We discuss the recent BRETFFELD's works (1992a, 1992b). This author distinguishes the genera *Prorastriones* and *Fasciosminthurus* which have been considered as synonymous by BETSCH (1977). The characters used for separating these two genera and also *Cyprania* Bretfeld, 1992 are discussed. Further information is given about the description of *Fasciosminthurus lacazei* (Denis, 1924). One new species is described: *Fasciosminthurus dictyostigmatus* n. sp. A standardization of the description of Symphypleona is proposed. So, for each species a standardized table of appendicular chaetotaxy is given.

Key-words: Collembola - Symphypleona - Bourletiellidae - taxonomy - Europe

1. INTRODUCTION

The genus *Prorastriones* was created by DELAMARE DEBOUTTEVILLE in 1947, for an African species: *Prorastriones pulcher*. The original description was insufficient. A study of the material by BETSCH (1977) shows that the empodium ends in a long filament and a strong spike and that the spinelike setae on the inner side of tibiotarsi are flattened at their tip (obliquely truncate setae). In 1955, STACH created the genus *Andiella* for two andean species (*A. paryskii* and *A. domeykoi*) displaying an empodium ending in a long filament and a strong spike, and displaying also obliquely truncate setae on the inner side of tibiotarsi. One of the conclusions of BETSCH's (1977) paper was to consider *Prorastriones* and *Andiella* as synonymous, because these two taxa had the same generic characters (morphology of the empodium and tibiotarsal setae).

In 1956, JEANNENOT showed that the European species *Deuterosminthurus quinquefasciatus* Krausbauer, 1902 presents the same kind of empodium and tibiotarsal setae as *Andiella* (at this time JEANNENOT could not know that *Prorastriones* has also these characters). GISIN in 1960 did not follow JEANNENOT, and he gathered the European species of Bourletiellidae with a long empodial filament into the *Fasciosminthurus* sub-genus (included in *Bourletiella* genus). Later, BETSCH (1977) considered *Fasciosminthurus* and *Prorastriones* (= *Andiella*) as synonymous.

From a study on new characters of an abundant material, particularly the types of *Prorastriones pulcher* Delamare Deboutteville, 1947 (genotype of *Prorastriones*) and *Andiella paryskii* Stach, 1955 (genotype of *Andiella*), BRETTFELD (1992a, 1992b) showed that the synonymy established by BETSCH (1977) between *Prorastriones* and *Fasciosminthurus* Gisin, 1960 might be questioned. On the other hand, the synonymy of *Andiella* and *Prorastriones* genera has been retained.

In this paper, the *Fasciosminthurus* - *Prorastriones* distinction will be conserved, but with a list of discriminant characters more restricted than that proposed by BRETTFELD (1992b).

Finally, we will deal with some methodological aspects of Symphypleona description. We will propose a standardization of chaetotaxic tables and a typical plan.

In the descriptions the following abbreviations will be used: abd. = abdomen — ad. = adult — alt. = altitude — an. app. = anal appendage — ant. = antennal segment — dep. = department — ceph. diag. = cephalic diagonal — ex. = example — juv. = juvenile — ov. org. = oval organ — prov. = province — st. = stage.

2. THE PROBLEM OF DESCRIPTION AND CHAETOTAXIC NOMENCLATURE IN SYMPHYPLEONA

BRETTFELD (1990, 1992a, 1992b) did not discuss the plesiomorphic or apomorphic state of the characters he used. That led him to refrain from making any phylogenetical considerations: "Well-founded phylogenetical considerations will not be possible until more taxa are completely described" (BRETTFELD 1992a, p. 7). Such an argument does not resolve the problem of the phyletic value of the *Prorastriones* - *Fasciosminthurus* separation.

According to us, our works about the appendicular chaetotaxy of Symphypleona are now sufficiently well on to allow the distinction for some characters between the plesiomorphic and apomorphic states. A first set of works (NAYROLLES 1988, 1990a, 1990b, 1991a) was to establish the general chaetotaxy that we can define as a synthesis of the chaetotaxy of one body area. This synthesis has been reached after having studied some species chosen among a large taxonomic range (in our studies it was at least one species for each European family of Symphypleona). During this work, it is necessary to be particularly interested in the chaetotaxic development. A rigorous distinction of the homologies can be then realized (what is not the case in a simple setae counting). Once this step is passed, the study of the European Sminthuridae and

Bourletiellidae that we have set about, allows to give us some ideas about both the evolutive trend of some characters and the relative importance of these characters.

So, our approach noticeably conflicts with the BRETTFELD's idea (1992a, p. 7): "The first goal was to demonstrate that one can describe one species completely and in detail as the standard, and can describe rather briefly the other species without loss of precision by noting mainly the differences from the standard". Because the standardization of the chaetotaxic patterns cannot be established on only one species, or, as BRETTFELD (1990) did it, on only one family (he studied 4 species of Bourletiellidae, each of them belonging to one genus). As a matter of fact, the lack of taxonomic wide-ranging of such studies prevents any schematization based on theoretical considerations. Therefore, the taxonomist cannot understand a chaetotaxy which is too different from the chaetotaxic pattern that it had been regarded, somewhat arbitrarily, as standard.

There is here an old dilemma: some people advocate the use of a dialectic between observations themselves and theorization of these observations, other people prefer a more immediate approach which sticks to the observed realities. The approach we adopted in our works about appendicular chaetotaxy of *Symphyleona* follows the first turn of mind. It results a certain complexity of the descriptions; so, about the chaetotaxy of the basis of legs, BRETTFELD (1992a, p. 10) writes: "I did not follow NAYROLLES, but preferred a practical scheme because the nomenclature of NAYROLLES is rather complicated though derived from postembryonic development, and because the tables are so difficult to survey as are long chaetotaxic formulae." Probably, the theorization of the observations leads to a surplus of complexity or information. Nevertheless, for studies about chaetotaxy, we think that some theoretical processes are necessary, in order to establish what are the homologous setae between species. So, BETSCH & WALLER (1989, p. 16) write: "la recherche des homologues doit être une priorité absolue actuellement si l'on veut tirer des conclusions sur les affinités des unités taxonomiques, quel que soit leur niveau hiérarchique. [...] La systématique gagnera à une proposition cohérente de nomenclature des structures morphologiques, en particulier au plan chétotaxique."

A current mistake consists in realizing a simple setae counting, that may lead to a mix up of two situations that are very distinct from a phyletic point of view. For example, it is the case when we make a counting of the setae on the posterior generatrix, Gp, of the median tibiotarsus (NAYROLLES 1991b). The present setae on Gp can be the 5 primary setae Ip, Iip, IIIp, IVp and Vp, as the two secondary setae 3p and 4p. A simple counting giving the number of 5 setae on Gp can be realized on different ways; for example: Ip, Iip, IIIp, IVp, Vp for a taxa and Ip, Iip, IIIp, 3p, 4p for another one. The confusion between these two situations, through a simple setae counting, leads to wrongly consider as homologous two chaetotaxies that are not. This problem could be met if the BRETTFELD's (1990, p. 477) formula about tibiotarsal chaetotaxy would be strictly applied.

We recall the BRETTFELD's formula: a first item gives each seta on the first whorl (the most distal) with the character "-" used for lacking; a second item gives, for each

pair of legs and on each generatrix, a counting of the setae at the basis of the first whorl. As we just have been explaining, the counting of setae on their generatrix leads to find for two taxa the same number made up by two distinct chaetotaxies. Besides, BRETFFELD (1992a, 1992b), certainly conscious of this problem, has added to his formula a further information raising the ambiguities about the present setae. This formula can also be open to criticism through its first item. As a matter of fact, this item gives the present setae on the first whorl, supposing that for this whorl the 3 pairs of tibiotarsi are the same; concerning this subject, BRETFFELD (1990, p. 477) writes: "the pattern of which was identical for all tibiotarsi". Yet, in *Dicyrtomina ornata* (Nicolet, 1842) the seta Ia (on the first whorl and on the anterior generatrix) is lacking on foreleg, but is present on median and hind legs (NAYROLLES 1988). BRETFFELD himself met this problem when he described *Prorastriones cingulus cingulus*; he got around this difficulty noting between brackets the setae Jp and Ia which are indicated in his "Additions to the formulae" as wanting on foreleg and mesoleg but present on hindleg. The BRETFFELD's formula aimed at a more practical presentation than the table-form given in our study. So, dealing with our presentation, BRETFFELD (1990, p. 472) writes: "Such systems are rather complicated, and knowledge of juveniles, especially of the 1st and 2nd instars, is necessary, a condition that cannot always be maintained in the practical work of species description and determination." We contest the fact that one ought to study the tibiotarsal chaetotaxy of the first two stages in order to build up the adult one. In absolute terms, it is excellent to be able to study the chaetotaxy of every stage, in order to get ontophylogenetical studies prospects. Nevertheless, one can easily build up tibiotarsal chaetotaxy of one species only from the adults. In fact, BRETFFELD followed this approach in his description of *Fasciosminthurus obtectus*, when he described this species on exclusively adults composed material.

For all these reasons, we prefer to keep our presentation in table-form. A size reduction of chaetotaxic tables that we have presented until now, yet turns out to be necessary. This problem will be discussed farther on. As far as the chaetotaxy of the basal segments of legs, or furcula, or antenna is concerned, we take up again our nomenclature (NAYROLLES 1990a, 1990b, 1991a) which allows an interpretation of setal arrangements and the building up of a general nomenclature for the whole Symphypleona group.

3. THE DISTINCTION OF THE GENERA *Fasciosminthurus* GISIN, 1960 *sensu* BRETFFELD, 1992 AND *Prorastriones* DELAMARE DEBOUTTEVILLE, 1947 *sensu* BRETFFELD, 1992

First, we question some characters used by BRETFFELD (1992b, p. 49) for separating *Fasciosminthurus* from *Prorastriones*. Then, we will discuss the phylogenetical value of some characters.

The character 4 of BRETFFELD's list: "Ant. IV dist. whorls without V", corresponds, from our nomenclature of antennal setae (NAYROLLES 1991a), to the number of whorls without seta on H_{ip} from the whorl AIII inclusive and by counting towards the

basis. For this character, the number 1 given by BRETFFELD corresponds to the presence of the seta M1ipi, the numbers above 1 (2 or 3) correspond to the absence of this seta. According to BRETFFELD, the seta M1ipi is present in *Fasciosminthurus* (because he gave the number 1 for the character in question), whereas we have observed that *Fasciosminthurus raynalae* (Nayrolles, 1988) and *Fasciosminthurus dictyostigmatus* n. sp. do not have the seta M1ipi. The character 4 in BRETFFELD's list so cannot be conserved to separate *Fasciosminthurus* from *Prorastriones*.

The character 5 of BRETFFELD's list: "Ant. IV tip sensilla" corresponds to the number of bacilliform setae at the apex of Ant. IV. According to our work about the antennal chaetotaxy, these setae are: AA, those of whorl AI, as AIIai, AIII and AIIpi, thus 12 setae in total. According to BRETFFELD, *Prorastriones* has 12 setae, while *Fasciosminthurus* presents only 11 of them. The absent seta of *Fasciosminthurus* corresponds to Alp. We have observed a species of *Fasciosminthurus*, *F. lacazei* (Denis, 1924), keeping Alp. So the character 5 in BRETFFELD's list cannot be conserved in order to separate *Fasciosminthurus* from *Prorastriones*. We can remark that BRETFFELD has indeed examined the DENIS' type material of *lacazei* (one slide with the head and the body, another one with the legs); he could not yet distinguish the 12 bacilliform setae at the apex of ant. IV. As a matter of fact, as we saw ourselves, the bad preservation of the DENIS' slides does not allow the observation of this character.

The character 14 of BRETFFELD's list: "Tibt. I seta 4i" corresponds to the presence (+) or to the absence (-) of the seta (TI1)4i1 (see the tibiotarsal setae nomenclature, NAYROLLES 1988 and the legs segments nomenclature, NAYROLLES 1990a). The seta in question is given by BRETFFELD as absent in *Fasciosminthurus*, but as present into *Prorastriones*, however we will see that *Fasciosminthurus dictyostigmatus* n. sp. has this seta. Thus, the character 14 in BRETFFELD's list cannot be conserved in order to separate *Fasciosminthurus* from *Prorastriones*.

The character 17 of BRETFFELD's list: "Tibt. oval organs" corresponds to the number of ov. org. on the tibiotarsi. BRETFFELD gives the number 1 for *Fasciosminthurus* (O2pe is only present) and 2 for *Prorastriones* (O2pe and O3pe are present). However, *Fasciosminthurus lacazei* (including the type material) has 2 ov. org. Then, the character 17 in BRETFFELD's list cannot be conserved in order to separate *Fasciosminthurus* from *Prorastriones*.

Except the characters 2, 5, 14 and 17, which do not have value to distinguish *Fasciosminthurus* from *Prorastriones*, there are 12 characters left in BRETFFELD's list separating *Fasciosminthurus* from *Prorastriones*.

As we already said, BRETFFELD did not discuss the evolutive state of the characters he used for separating *Prorastriones* from *Fasciosminthurus*. That sets the problem of the phyletic value as regards to the separation of these two genera. According to our studies, we think that we can give quite surely the evolutive trend of some characters as their relative importance.

From a phyletic point of view, the primary setae turn out to be the most interesting. On that subject, two characters seem to us particularly remarkable. It is a matter of the character 13 noted "Tibt. I, II seta Jp", which corresponds to the presence/absence of (TI1,2)Jp and the character 15, noted "Tibt. III seta Ia", which

corresponds to the presence/absence of (TI3)Ia. *Fasciosminthurus* has (TI1,2)Jp, while this one is lacking into *Prorastriones*. It is the opposite for (TI3)Ia. Into the others Symphypleona families, Jp is present and incontestably its disappearance constitutes an apomorphy. Ia is present in most Symphypleona families, and when it is lacking its absence is manifestly evolved: on the foretibiotsarsus of Dicyrtomidae, in *Caprainea bremondi* (Delamare & Bassot, 1957) (Sminthuridae), in *Sphaeridia* (Sminthurididae) in which the absence is connected with the intense paurochaetosis.

The conclusions that we can give are the following ones: for (TI1,2)Jp *Fasciosminthurus* is primitive and *Prorastriones* evolved and for (TI3)Ia *Fasciosminthurus* is evolved and *Prorastriones* primitive. From a phylogenetical point of view, this couple of characters allows to separate *Fasciosminthurus* from *Prorastriones*. However, according to the cladistic concepts, this argument is not sufficient to justify the evolutive separation of the two genera, since all the characters have not been considered: the explanation we have given was a necessary condition for putting forward the hypothesis of the distinction between the two genera, but this explanation is not sufficient.

The biogeographical argument is certainly at least as much convincing to justify the separation between *Fasciosminthurus* and *Prorastriones*. *Fasciosminthurus* has a palearctical distribution (the presence of *F. quinquefasciatus* in Australia is due to an introduction, GREENSLADE & IRESON 1986). Besides, as BRETFFELD (1992a) underlines it, the hypothesis of DELAMARE DEBOUTTEVILLE & MASSOUD (1963) in which *F. quinquefasciatus* would have been imported from South America to Europe is wrong. *Prorastriones* is present in Africa (with the type species *P. pulcher*) and in Southern America. The Southern American species were described (STACH 1955, DELAMARE DEBOUTTEVILLE & MASSOUD 1963) as *Andiella*. *Prorastriones cingulus* (Bonet, 1933) is present in Australia and Japan, probably this species was introduced in these countries (BRETFFELD 1992b).

4. ABOUT THE GENUS *Cyprania* BRETFFELD, 1992

BRETFFELD (1992b) described a new genus in Cyprus: *Cyprania*, which has only one species: *C. gisae*. This genus seems to be very close to *Fasciosminthurus*. Three characters of BRETFFELD's list (1992b, p. 49) used for separating *Fasciosminthurus* from *Cyprania* ought to be questioned.

The first is the character 3: "Ant. IV sens. P, whorl from distal". On ant. IV, the blunt setae of the intergeneratrix Hppe are called by BRETFFELD (1990) with p or P whether their thickness is respectively weak or strong. The character "Ant. IV sens. P, whorl from distal" designates the first whorl on ant. IV from the apex that bears a thick cucumiform seta. When in fact, according to our observations, the distinction done by BRETFFELD in his work of 1990 between thick seta (P) and thin seta (p) is really open to criticism, the differences of thickness being so weak and gradual along the antennal segment.

The second character that needs to be questioned is the 5th: "Ant IV tip sensilla", for the same reasons as the ones given about the distinction between *Fasciosminthurus* and *Prorastriones* (see above). Note that (AQ)A1p is present in *Cyprania*.

The third character that needs to be questioned is the 17th: "Tibt. oval organs". As we have seen, one or two ov. org. can be present on the tibiotarsi of *Fasciosminthurus* (in his list, BRETFFELD noted only one of them); it is also true for *Cyprania*.

The remaining characters used for separating *Fasciosminthurus* from *Cyprania* are:

- character 6 of BRETFFELD's list: "Gr. Abd. row 5". We are not competent for discussing the importance of this character.
- character 19: "Female circumanal setae". In *Cyprania* several circumanal setae are serrated, they are all smooth in *Fasciosminthurus* and *Prorastriones*.
- character 23: "App. an. to unguis III". The an. app. is short, wide ("ribbonlike"), with a truncate and toothed apex in *Cyprania*. The an. app. of *Fasciosminthurus* and *Prorastriones* remains spinelike.
- a character absent from BRETFFELD's list but which is quoted by the author, concerns the mucronal anterior lamella. This last-mentioned is double in *Fasciosminthurus*, i.e. it is built with two separated crests (NAYROLLES 1990b). BRETFFELD writes about the one of *Cyprania* (1992b, p. 47): "mucro anterior furrow very narrow". Then, we do not know if the anterior lamella is double but narrow or if it is simple (in this case the two crests are jointed).

The morphology of circumanal setae and an. app. is not always sufficiently important for justifying a generic separation. For instance, in *Bourletiella* the shape of these setae really varies from *radula - pistillum* group to *hortensis - viridescens* group. On the other hand, according to our observations on the whole Symphypleona group, the state "double" or "simple" of mucronal anterior lamella could be a good criterion to justify a generic separation. Regretfully we do not know the state of this character in *Cyprania*.

The number and the value of the differences between *Fasciosminthurus* and *Cyprania* seem sufficiently reduced to suggest the hypothesis that *Cyprania gisae* could only be a particular species into *Fasciosminthurus* genus. The absence of difference in biogeography of these two genera can also be remarked: both of them are met in Europe. This question will perhaps be resolved with a better prospecting of the Mediterranean area, *Cyprania gisae* having been collected there and this area corresponding to the greatest diversification of *Fasciosminthurus*.

5. ABOUT THE TAXONOMIC STATUS OF *Fasciosminthurus albanicus pontignanoi* BRETFFELD, 1992 AND *Prorastriones cingulus venezuelae* BRETFFELD, 1992.

BRETFFELD (1992a) distinguished two sub-species of *Fasciosminthurus albanicus* (Stach, 1956): *F. albanicus albanicus* and *F. albanicus pontignanoi*. Both forms have

the same coloration and share several characters. These are the reasons why BRETFFELD considered them as sub-species. Nevertheless, two characters separating *F. a. albanicus* from *F. a. pontignanoi* present a great importance from a phyletic point of view. Thus, according to us (from our observations of the whole Symphypleona group), these two characters are sufficient to fully attribute the species status to both of these forms. These characters are the presence/absence of (TI2)IVp and the presence/absence of (TI3)IIIp (these setae are present in *F. a. albanicus* and absent in *F. a. pontignanoi*). As regards the problem of coloring, it is not surprising that these two taxa are similar. As a matter of fact, nothing is remarkable in the colour of the body which is composed of a diffuse pigment, essentially distributed in the behind area of the great abd.: it has not the coloring specificity of *F. raynalae* or *F. quinquefasciatus*. The head has a horizontal colored stripe below the antennae, whereas this attribute can also be found in other species.

Thus, we propose *Fasciosminthurus albanicus pontignanoi* to be raised to specific rank: *Fasciosminthurus pontignanoi* Bretfeld, 1992, stat. nov.

The same problem arises for two *Prorastriones* sub-species distinguished by BRETFFELD (1992b): *P. cingulus cingulus* and *P. cingulus venezuelae*. In the first one, (TI1,2)Ia, (TI1,2)Ili, (TI2)Vp and (TI3)IVp are absent, while they are present in the second one. These differences are widely sufficient for proposing *Prorastriones cingulus venezuelae* to be raised to specific rank: *Prorastriones venezuelae* Bretfeld, 1992, stat. nov.

6. SOME PROPOSITIONS FOR STANDARDIZING THE SPECIES DESCRIPTION

6.1. GENERAL POINTS

The aim of our statement is to standardize species description. This account will be used in our coming works about Bourletiellidae. Most of our explanations are similar to those that we give in a current work about the Sminthuridae family.

The body and head chaetotaxy is not yet sufficiently well-known to be used. BRETFFELD's (1990) work, limited to the Bourletiellidae, will have to be reviewed in the light of a study on the whole Symphypleona group (like the one given by BETSCH & WALLER 1989 about the trichobothrial pattern). Besides, it would be proper to underline the difficulties of studying the great abd. As a matter of fact, specimens in slide are laid on their flank, and the digestive tube, which is often full of pollen or mycelium, can considerably limit the examination of the farthest side from the observer.

As far as the appendicular chaetotaxy is concerned, we have observed each stage of development. For each species, our observations generally concern one population, with sometimes some comparisons with other specimens from other populations.

Sometimes, some setae are variable. For each case of variable seta, we can generally observe a great proportion of dissymmetrical specimens. That can be interpreted by considering that the frequencies distribution of one variable seta approximates a binomial law. Consequently, as regards the presence/absence of a variable seta, both sides of one specimen can be considered as approximately independent. This

model of variability had been previously noticed in Acari by GRANDJEAN (1939, 1949, 1952).

In a previous work we studied for every species one (sometimes two) 1st stage specimen, two 2nd stage specimens and four specimens for every later stage. At this step, we determined, for every stage of every species, the absent, or present, or variable setae. In most cases, the variable setae appear either at the 3rd stage, or at the 4th stage, which is the adult in Bourletiellidae. For defining with better precision their frequencies, other preparations were made. During these new observations, only the setae defined as susceptible to be variable were studied. When the number of specimens was sufficient, we made around six complementary preparations for each stage, so as to lead the observations on about ten specimens. Seeing that the appendages are paired, it results about twenty observations. Thanks to the complementary observations, for each stage, we can definitively define the setae that we consider as present, or absent, or variable. According to some of our previous works (NAYROLLES 1989, 1991a), in a general way, we consider a seta as variable when it is present between the one fifth and the four fifths of the observations (below one fifth the seta is considered as absent, and above four fifths the seta is considered as present and constant). The rate of presence will be given through the occurrence (noted oc) which corresponds to the probability of presence given by one digit.

The appendicular chaetotaxy (antennae, legs and furcula) is presented in a table which takes up only one page. The chaetotaxic tables that we have given in our studies about the general chaetotaxy of the Symphypleona appendages (NAYROLLES 1988, 1990a, 1990b, 1991a) required in all two pages and a half. Thus, a size reduction of these tables becomes useful. So, it will be possible to make identification sheets, in the future a computer filing will be interesting. This one would allow the achievement of a data bank which would be provided by the researches of all the specialized in Symphypleona Collembologists.

With the chaetotaxic table, we give a text for the description of each species. We propose for this text a standardized plan.

6.2. MAKING UP STANDARDIZED CHAETOTAXIC TABLE

The idea consists in replacing the legend on the left side by a set of symbols.

The symbols of the different segments are written in the left column.

In the second column, on several occasions, two Greek letters are used: Π for absent primordial setae (in this case, the character – means that none of these setae are absent), and Δ for secondary setae present, or setae with a particular form, or any remark.

The first table concerns the antennae with symbols as follows (adapted from NAYROLLES 1991a): AP = first antennal segment, AD = second antennal segment, AT = third antennal segment, AQ = fourth antennal segment. Concerning AQ, in the second column, "str" is used for the chaetotaxic structure, A, M and B for the different sections of this segment. M and B are gathered, the H setae are distinguished from the G setae.

The second table concerns the legs and is vertically divided in three parts. From left to right, these three parts correspond respectively to the anterior, median and posterior legs. The following symbols are used (NAYROLLES 1990a): SB = basal subcoxa, SA = apical subcoxa, CX = coxa, TR = trochanter, FE = femur, TI = tibiotarsus. In the second column, prc = subcoxal process, K = presence (noted +) / absence (noted -) of K setae, FP = presence/absence of FP setae. As far as the tibiotarsi are concerned, we consider that the set of primary setae on the whorls constitutes the primordial chaetotaxy (for the definition of the primordial chaetotaxy, see NAYROLLES 1990a, 1990b, 1991a).

The third table concerns the furcula. Here, the symbols used (NAYROLLES 1990b) are: MA = manubrium, DE = dens, MU = mucro.

Into the three tables, the stage of appearance of a seta is given by a letter: P for a primary seta, D for a seta emerging at the 2nd stage, T for a seta emerging at the 3rd stage, Q for a seta emerging at the 4th stage and C for a seta emerging at the 5th stage (symbols from NAYROLLES 1991a). When a seta is variable at the stage in which it appears, the letter that symbolizes this stage is written between brackets; if during a stage of the development it becomes constant, this stage is also indicated. For example, (T) means that a seta appears with variability at the 3rd stage and remains variable; (T)Q means that a seta appears with variability at the 3rd stage and becomes constant at the 4th.

In comparison with the already published tables, the following rubrics are not taken up here:

- for AT: "Papille tégumentaire" = "integumentary protuberance" as RICHARDS (1968)
- for DE: "Papilles dentales" = "dental papillae" as RICHARDS
- for FE: "cup" = "organe en cupule" which we can translate into cuplike organ.

The integumentary protuberance of ant. III and the dental papillae are lacking into Bourlettiellidae. The cuplike organ, which is very slender, may present an observation too difficult to be systematically reproduced. Nevertheless, the good optical material we could use allowed us to search the existence of this organ. Its presence will be quoted in the text.

As regards AQ, we give the occurrence of H setae on each intergeneratrix by the following mean: for example, concerning Heae of *Fasciosminthurus lacazei*, 1-1-1-1-0/0 signifies that, from the apex to the basis, each of the first four whorls of M (M1, M2, M3, M4) bears one seta (oc = 1), the last (M5) does not (oc = 0) and the section B (separated by the character /) does not either. Besides, we give the mean (m) of the antennal variable h^* . With $h^* = (Heae^* + Hppe^*)/2$, wherein $Heae^*$ is the number of setae on Heae which are present on M and B; $Hppe^*$ is the number of setae on Hppe which are present on M and B.

6.3. STANDARDIZED PLAN FOR DESCRIPTION

We propose the following typical plan:

- Development. We give the number of juvenile stages.

- Size of adults. The body length is measured from specimens in alcohol, from the face to the tip of the small abd.
- Colour. The description is based on specimens in alcohol.
- Great abd. The trichobothrial pattern is given in accordance with the criteria of BETSCH & WALLER (1989).
- Antennae. We give the means of the antennal ratios ant. I : II : III : IV and ant. : cephal. diag. Then, we give the values of 3 chaetotaxic variables (noted G , ISh^* and RSh) which are characteristic of ant. IV. G is equal to the number of G setae on ant. IV. $ISh^* = h^*/(V+1)$, wherein h^* (already seen) is equal to the half of the number of setae on Heae and Hppe present on the sections M and B, and V is equal to the number of whorls on M. RSh is equal to four times the total number of setae on Heae and Hppe divided by G . For G we give the mean (m), the minimum (min), and the maximum (max), for ISh^* and RSh we just give the mean.
- Head.
- Legs.
- Ventral tube.
- Retinaculum. The number of teeth per ramus is given. We recall that the basal horn on the corpus is not to be considered as a tooth.
- Furcula.
- Small abd. We give the ratio an. app. : mucro.

7. ACCOUNT OF SPECIES

7. 1. *Fasciosminthurus lacazei* (Denis, 1924)

The study of both Denis' slides, kindly loaned by J.-M. Betsch, allows us to identify some specimens of our collects as belonging to the species *lacazei* (from the criteria of the empodial filament morphology and the presence of (TI.)O3pe).

Material

SPAIN, prov. Lérida, near Seo de Urgel, just before the road going to Artedó, northern side of Sierra del Cadí, alt. 950 m; Garrigue on a stony limestone slope with pubescent leaves oaks and *Lavandula vera*, *Thymus vulgaris*, *Quercus ilex*, *Genista scorpius*, *Stæhelia dubia*, *Buxus sempervirens*, *Amelanchier vulgaris*, *Euphorbia serrata*, *Lonicera etrusca*, *Helleborus fætidus*, etc.; collected with a net (LE9). 14-VI-1987: 1 juv. in preparation and 2 ad. — Prov. Huesca, Collado de Eripol, alt. 860 m; Garrigue with *Genista scorpius*, *Thymus vulgaris*, *Rosmarinus officinalis*, *Dorycnium pentaphyllum*, *Lavandula latifolia*, *Juniperus communis*, *Juniperus phænicea*, *Buxus sempervirens*, *Pinus silvestris*, *Arctostaphylos uva-ursi*, etc.; collected with a net (HU18). 31-VII-1987: 7 ex.; 2 juv. and 2 ♀ in preparation. 30-V-1990: 1 ♂ and 1 juv.; all in preparation. 21-VI-1990: 22 ex.; 5 juv., 3 ♂ and 3 ♀ in preparation.

Deposit of material. — Muséum d'Histoire naturelle de Genève, SWITZERLAND: station HU18, 21-VI-1990, 6 ex. in alcohol. — Laboratoire de Zoologie, Ecobiologie des Arthropodes édaphiques, Université Paul Sabatier, Toulouse, FRANCE: the rest of the material.

Description

Development. — Number of juv. st. = 3.

Size ad. — ♂: 0.5 - 0.7 mm; ♀: 0.6 - 0.8 mm.

Colour (fig. 1). — Background varying from white to yellow. Flanks of great abd. with many grey-black spots, especially in the posterior area. In the anterior area the spots are laid in two or three transverse alignments which are often broken in the medio-dorsal area. Small abd. with the back of abd. V grey as the apical outline of the upper anal flap. Head with grey maculae behind the eyes, on the sides and face. Eyepatch surrounding light. Between the eyes, an ochred brown, more or less orangey, stripe getting wider between the antennae which are brown. Eyepatches black. Legs and furcula white.

Great abd. — Trichobothria: A, B and C in linear pattern. Dorsal setae: mesochaetae.

Antennae (figs 5-8). — Antennal ratios: nearly the same for both sexes, ant. I : II : III : IV = 1 : 1.9 : 2.4 : 5.9 and ant. : ceph. diag. = 1.6. Chaetotaxic variables: for *G*: $m = 88.5 / \min = 84 / \max = 92$; $m(ISH^*) = 0.58$; $m(RSh) = 0.41$.

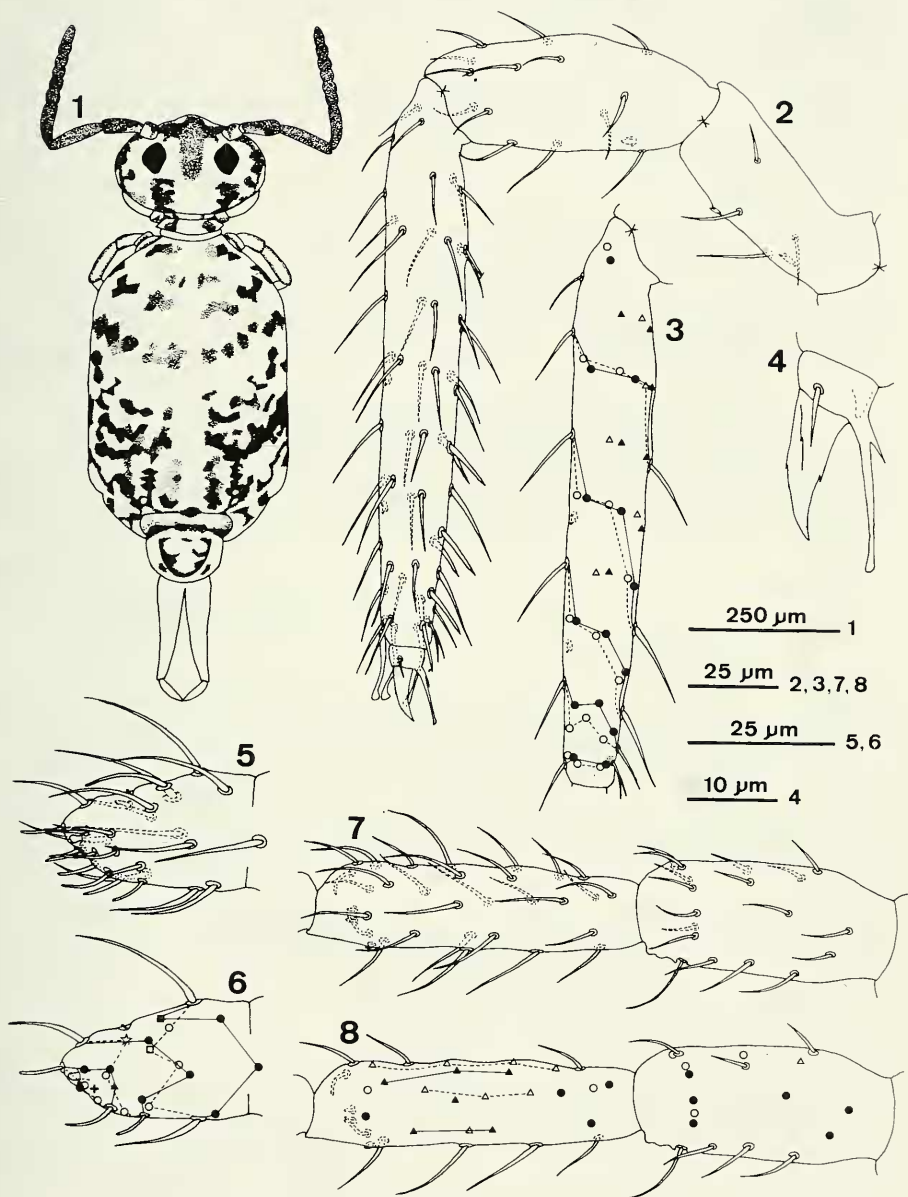
Head. — Eyes: 8+8; eyepatch with 2 setae. Cephalic setae: mesochaetae. 1+1 ov. org. behind the head (except one specimen with 2+2). Labral formula: 6/5-5-4.

Legs (figs 2-4). — Femur: cup present. Numbers of obliquely truncate setae on the fore, median and hind tibiotarsi: 7, 8, 9. Claw with a small tooth on the inner crest. The empodial filament overhangs the claw. It is thick but narrower in its subterminal part. It is also weakly clavate.

Ventral tube. — At the 1st st., sacs very weakly warty, probably wholly warty from the 2nd (unobserved at the 2nd st.). Chaetotaxy: apical flaps with one pair of primary setae, corpus without seta.

FIGS 1-8

Fasciosminthurus lacazei ad.; 1: habitus; 2: foreleg, anterior view; 3: schematic representation of foretibiotarsus (from fig. 2). The setae of Ge and Gi as the ov. org. are drawn; the others are schematized according to the following understanding: a full symbol for a seta on the reader's side (thus on the anterior side), an empty symbol for a seta on the opposite reader's side, a ring for a primary seta, a triangle for a secondary seta. The setae belonging to a same whorl are linked together by a line which is continuous on the anterior side and discontinuous on the other side; 4: forepraetarsus, anterior view; 5: section A of ant. IV, anterior view; 6: schematic representation of the fig. 5. The setae of Ge and Gi are drawn; a full symbol for a seta on the reader's side (thus on the anterior side), an empty symbol for a seta on the opposite reader's side. A square for the H setae, a cross for AA, a star for AIIpe, a triangle for the secondary seta (AIai), a ring for the other setae. The setae belonging to a same whorl are linked together by a line which is continuous on the anterior side and discontinuous on the other side; 7: ant. II and III, anterior view; 8: schematic representation of the fig. 7. The setae of Ge and Gi as those of antennal III organ (Xe, Xi) and its guard setae (Aai, Api, Ape) are drawn; the others are schematized according to the following understanding: a full symbol for a seta on the reader's side (thus on the anterior side), an empty symbol for a seta on the opposite reader's side, a ring for a primary seta, a triangle for a secondary seta. The symbols of secondary setae belonging to a same generatrix are linked together by a line which is continuous on the anterior side and discontinuous on the other side.



Appendicular chaetotaxy of *Fasciosminthurus lacazei*

AP	Δ	—																																																																										
AD	Π	—																																																																										
	Δ	D: i0 T: i+1, e+1, pe+1 Q: i-1 Ai is a trichobothrium.																																																																										
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	Δ	<table border="1" style="display: inline-table; margin-right: 20px;"> <tr> <td></td> <td>Ge</td> <td>Gae</td> <td>Ga</td> <td>Gai</td> <td>Gi</td> <td>Gpi</td> <td>Gp</td> <td>Gpe</td> </tr> <tr> <td>Setae -1</td> <td>Q</td> <td>T</td> <td></td> <td>T</td> <td></td> <td></td> <td>T</td> <td>T</td> </tr> <tr> <td>Setae 0</td> <td></td> <td>D</td> <td>D</td> <td>Q</td> <td>D</td> <td>D</td> <td>T</td> <td>D</td> </tr> <tr> <td>Setae +1</td> <td></td> <td>T</td> <td></td> <td></td> <td>T</td> <td></td> <td>Q</td> <td>T</td> </tr> </table> Other setae: Q: pe+2				Ge	Gae	Ga	Gai	Gi	Gpi	Gp	Gpe	Setae -1	Q	T		T			T	T	Setae 0		D	D	Q	D	D	T	D	Setae +1		T			T		Q	T																																				
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AQ	str	B is completely zoned. Section M euwhorled with 5 whorls. Right euwhoriation. Subsegmentation formula: 1 + 5 + 1 = (A) + (M1, 5) + (B). Right subsegmentation.																																																																										
	A	Π	—																																																																									
		H	Allleae, Allppe																																																																									
		Δ	Apical bulb: in part invaginated Subapical organ: very small D: Alai Allpe is a blunt microchaeta																																																																									
	M & B	H	The occurrences of H setae on M & B are: for Heae 1-1-1-1-0/0. for Hipi 1-1-0-0-0/0 and for Hppe 1-1-1-0-0/0. m(h) = 3.5.																																																																									
		G	Setae of BB: P: BBae, BBae, BBa, BBp, BBpe / BA with one variable seta: BAe (oc = 0.7) / n80%(BM) = 9-14 / n80%(B) = 21-27 / all G setae on M are present / n80%(G) = 86-92. BBae is a blunt microchaeta upon a wide base. This seta undergoes a reduction size during its development. BBa is a cucumiform seta upon a wide base.																																																																									
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	Δ	pe1 delayed primordial seta: Q: ae3 T: pe2, Op Q: pe4 T: a5, pe2, Op Q: pe4 T: a5, ai2, pe2 Q: ai3, ai4, pe4, Oi																																																																										
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		T: 4ai1, 4i1, Vai, Vpi, FSA, O2pe Q: 3a, 3p, 4a1, 4pi1, 4ai2, 4pi2, FSai, FSpi, O3pe (Q): 4p1 (oc = 0.4) lpi, lp and lpe are spatulate setae. lai, llai, lpi, llai, llpi, lVai, lVi, lVpi are obliquely truncate setae.																																																																										
		T: 3ai, 3i, 4ai1, 4i1, Vai, Vpi, FSA, O2pe Q: 2a, 3a, 3pi, 4a1, 4pi1, 4ai2, 4pi2, FSai, FSpi, O3pe (Q): 2p (oc = 0.2) lp and lpe are spatulate setae. lai, lpi, llai, lpi, llai, llpi, lVai, lVi are obliquely truncate setae.																																																																										
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VI						Q	T	T																																																																				
Whori B	T		P			P	P	P																																																																				
MU	Δ	Chaetotaxy: — Morphology: anterior lamella double, outer and inner lamellae smooth.																																																																										

Retinaculum. — At the 1st st. rami tridentate, bidentate from the 2nd. Chaetotaxy: on the anterior lobe two setae appear at the 3rd st. and another one in the ad.

Furcula. — On Gpi of the dens, only IVpi is lacking.

Small abd. — Made up of abd.V + abd. VI. Trichobothria: D and E. The genital papilla of the ♂ with 14 to 17 setae. An. app. spinelike, straight, with or without small teeth at the tip (variable character). Ratio an. app. : mucro = 0.55.

7.2. *Fasciosminthurus dictyostigmatus* n. sp.

Material

Type material. — FRANCE, dep. Aveyron, district Montrozier, Causse Comtal, road of Gages, alt. 620 m; calcareous sheep meadow with *Bromus erectus*, *Kaeria valesiaca*, *Festuca gr. ovina*, *Coronilla minima*, *Hippocrepis comosa*, *Lotus corniculatus*, *Anthyllis vulneraria*, *Carduncellus mitissimus*, *Eryngium campestre*, *Teucrium chamædrys*, etc.; collected with a net (AV2a). 13-VI-1987. Syntypes: a thousand of ex.; 16 juv. and 10 ad. in preparation.

Other material. — Same station. 23-V-1987: 8 ex. 10-VII-1987: 4 ex.

Deposit of material. — Muséum d'Histoire naturelle de Genève, SWITZERLAND: 100 ex. of the type material in alcohol. — Muséum National d'Histoire Naturelle, Paris, FRANCE: 100 ex. of the type material in alcohol. — Laboratoire de Zoologie, Ecobiologie des Arthropodes édaphiques, Université Paul Sabatier, Toulouse, FRANCE: the rest of the material.

Description

Development. — Number of juv. st. = 3.

Size ad. — ♂: 0.55 - 0.65 mm; ♀: 0.7 - 0.9 mm.

Colour (figs 9-10). — Very constant and very characteristic coloring pattern, made up of small more or less dark grey-bluish spots on yellow background. Great abd. with one dorsal line, flanked of two more lateral other ones. These longitudinal stripes are linked by cross rows of pigment. There are still some spots under the most lateral of the cross rows. Small abd. with three spots (one median and two dorso-lateral) on abd. V and with a spot on the upper anal flap. Head with a cross stripe under the antennae, this stripe is cut in its middle. An orangey macula between the antennae which are brown. Eyepatches black. Legs and furcula without dark pigment.

Great abd. — Trichobothria: A, B and C in linear pattern. Dorsal setae: mesochaetae.

Antennae (figs 17-18). — Antennal ratios: in the ♀, ant. I : II : III : IV = 1 : 1.9 : 2.4 : 5.0 and ant. : ceph. diag. = 1.5 ; in the ♂, ant. I : II : III : IV = 1 : 1.9 : 2.5 : 5.4 and ant. : ceph. diag. = 1.7. Chaetotaxic variables: for *G*: m = 90.3 / min = 86 / max = 95 ; m(*Ish**) = 0.51 ; m(*RSh*) = 0.36.

Head. — Eyes: 8+8; eyepatch with 2 setae. Cephalic setae: mesochaetae. Head without ov. org. Labral formula: 6/5-5-4.

Legs (figs 11-15). — Femur: cup present. Numbers of obliquely truncate setae on the fore, median and hind tibiotarsi: 7, 9, 11. A tiny tooth, or even none, on the inner crest of the claw. The empodial filament overhangs the claw. It is rather thin, S curved and weakly thickened in its subterminal part.



Ventral tube. — At the 1st st., sacs very weakly warty, wholly warty from the 2nd. Chaetotaxy: apical flaps with one pair of primary setae, corpus without seta.

Retinaculum. — At the 1st st. rami tridentate, bidentate from the 2nd. Chaetotaxy: on the anterior lobe two setae appear at the 3rd st. and another one into the ad.

Furcula (fig.16). — Dental chaetotaxy as in *F. lacazei*.

Small abd. — Made up of abd.V + abd. VI. Trichobothria: D and E. The genital papilla of the ♂ with about 18 setae. An. app. spinelike, straight. Ratio an. app. : mucro = 0.48.

Etymology

dictyostigmatus = reticulum of maculae, that refers to the coloring of this species.

Discussion

BRETFELD (1992a) described in detail the chaetotaxy of the following species belonging to the *Fasciosminthurus* genus: *albanicus*, *circumfasciatus*, *obtectus*, *pontignanoi*, *quinquefasciatus*, *strigatus* and *virgulatus*. We studied the appendicular chaetotaxy of *cugnyi*, *lacazei*, *quinquefasciatus*, *raynalae*, *sauteri*, and *virgulatus* (the results will be published in a future paper). In comparison with the species of *Fasciosminthurus* in which the appendicular chaetotaxy has been observed, *F. dictyostigmatus* n. sp. can be distinguished by the presence of (TI1)4i1 and (TI3)IVp. The coloring is also characteristic of this species.

RÉSUMÉ

Nous discutons les récents travaux de BRETFELD (1992a, 1992b). Cet auteur distingue les genres *Prorastriones* et *Fasciosminthurus* qui avaient été mis en synonymie par BETSCH (1977). Les caractères établissant la séparation entre ces deux genres sont discutés, de même que ceux qui ont servi à la distinction de *Cyprania* Bretfeld, 1992. Nous complétons la description de *Fasciosminthurus lacazei* (Denis, 1924). Une nouvelle espèce est décrite: *Fasciosminthurus dictyostigmatus* n. sp. Une standardisation de la description des Symphyléones est proposée. Un tableau standardisé de la chétotaxie des appendices est ainsi donné pour chaque espèce.

FIGS 9-18

Fasciosminthurus dictyostigmatus ad.; 9-10: habitus; 11: mesopraetarsus, anterior view; 12: foretibiotsarsus, anterior view; 13: schematic representation of the fig. 12 - same understanding as the fig. 3; 14: hind tibiotsarsus, anterior view; 15: schematic representation of the fig. 14 - same understanding as the fig. 3; 16: furcula, posterior view. On the right, schematic representation with the following understanding: the setae of Ge and Gi are drawn, a full symbol for a seta on the reader's side (thus on the posterior side), an empty symbol for a seta on the opposite reader's side, a ring for a primary seta, a triangle for a secondary seta. On the dens, for the whorls I to IV and B, the setae belonging to a same whorl are linked together by a line which is continuous on the posterior side and discontinuous on the other side; 17: section A of ant. IV, anterior view; 18: schematic representation of the fig. 17 - same understanding as the fig. 6.

Appendicular chaetotaxy of *Fasciosminthurus dictyostigmatus* n. sp.

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	G	Setae of BB: P: BB _e , BB _{ae} , BB _a , BB _p , BB _{pe} / BA: complete whorl / n80%(BM) = 11-16 / n80%(B) = 24-29 / all G setae on M are present / n80%(G) = 88-93. BB _{ae} is a blunt microchaeta upon a wide base. This seta undergoes a reduction size during its development. BB _a is a cucumiform seta upon a wide base.																																																																																																
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MU	Δ	Chaetotaxy: —										Morphology: anterior lamella double, outer and inner lamellae smooth.																																																																																						

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